

WHAT IS CLAIMED IS:

1. A method of characterizing the biological activity of a candidate compound comprising:

placing a population of cells into an area of observation in a sample well;

5 exposing said population of cells to said compound;

exposing said population of cells to electric fields to produce a controlled change in transmembrane potential of said population of cells;

wherein said electric fields comprise a first pulse series and a second pulse series with a pause between the first pulse series and the second pulse series; and

10 monitoring changes in the transmembrane potential of said population of cells during at least a portion of said first pulse series and a portion of said second pulse series.

2. The method of Claim 1 wherein monitoring comprises optically monitoring.

3. The method of Claim 2 wherein optically monitoring comprises detecting fluorescence emission of a FRET based voltage sensor from an area of observation containing said population of cells.

4. The method of Claim 1, further comprising comparing data gathered from said first pulse series with data gathered from said second pulse series.

5. The method of Claim 1, wherein the changes in the transmembrane potential are indicative of ion channel recovery from block by said compound.

6. The method of Claim 1 wherein said pause has a duration that is at least as long as twice the time interval between any two pulses in the first pulse series.

25 7. A method of characterizing the biological activity of a candidate compound comprising:

placing a population of cells into an area of observation in a sample well;

exposing said population of cells to said compound;

30 exposing said population of cells to electric fields to produce a controlled change in transmembrane potential of said population of cells;

wherein said electric fields comprise a series of pulses;

monitoring changes in the transmembrane potential of said population of cells; and

comparing concentration dependence of transmembrane potential response to said electric fields at a first portion of said series of pulses with concentration dependence of transmembrane potential response to said electric fields at a second portion of said series of pulses.

8. The method of Claim 7 wherein monitoring comprises optically monitoring.

9. The method of Claim 8 wherein optically monitoring comprises detecting fluorescence emission of a FRET based voltage sensor from an area of observation containing said population of cells.

10. The method of Claim 7, wherein the changes in the transmembrane potential are indicative of use dependent block of an ion channel in said population of cells.